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SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
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EROSION CONTROL PRACTICES DIVISION

Soybean Yields in Relation to Topsoil Depth, Fertilizer Application and Cultural Methods - Dwight D. Smith, Columbia, Missouri.-"Yield results for the Series 4 soybeans plots this year did not show a significant yield difference between contour planting (42-inch rows) or drilling (7-inch rows) and up-and-down hill planting or drilling. Drilling resulted in an average yield of 33 bushels per acre in comparison to 26 bushels for planting. Ten inches of topsoil produced nearly 4 bushels more beans per acre than 7 inches of topsoil. These 1946 results are in general agreement with the average results for the 5 years that the plots have been in operation. The plots are only 90 feet long with 8 on a 2 percent slope and the other 8 on a 4 percent slope. The average results emphasize that the value of contouring on such soils is in the long-time effect of retaining the surface soil on the field. The deeper surface soil plots (10 inches) have produced from 3 to 9 bushels more beans per acre annually than the shallower soil plots (7 inches). During good bean years drilled beans have significantly outyielded rowed beans.

"The contour-rowed beans on the strip crop area this year yielded 22 bushels per acre on limed soil and with 300 pounds per acre of 0-20-10 fertilizer scattered on the plow sole, and 23 bushels per acre on limed soil and with 150 pounds per acre of 0-20-10 placed in bands on each side of the seed row. The unfertilized beans on land not limed yielded only 12-1/2 bushels per acre. Average results for the 5-year period show significant yield increase only when both lime and fertilizer were used. At present prices and the average yield increase lime and band application of the fertilizer returned $3.00 for each $1.00 invested in soil treatments; whereas with lime and the plow sole application of fertilizer the return was $1.71 per $1.00 invested in soil treatments, even though the yield increases were equal for the two methods of fertilizer placement."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Effect of Topsoil Depth on Crop Yields - O. R. Neal, New Brunswick, New Jersey.-"A compilation of all the data collected during the past six years (1941 -1946) of the effect of topsoil depth on yield is shown in the following table.

Tabulation of yield measurements from eroded and uneroded areas, 1941 through 1946

Crop	Year	Yield	
		Eroded Bu/A	Uneroded Bu/A
Potatoes	1941	329	370
"	1942	151	187
"	1943	164	228
"	1944	135	184
"	1945	237	290
"	1946	257	327
Corn	1943	61	85
"	1944	50	71
"	1945	10	21
"	1946	42	79
Oats	1944	21	32
Soybeans	1944	4	18
Barley	1944	25	52
"	1945	27	57
Rye	1944	14	52
"	1945	8	22
Wheat	1944	14	31
"	1945	17	31
"	1946	22	32
		Tons	Tons
Alfalfa[1]	1944	1.1	1.9
"	1945	0.9	1.4

1. Yields represent a single cutting.

"The terms "eroded" and "uneroded" are relative but indicate, in most cases, areas having less than six inches of surface soil and areas having more than six inches of surface soil, respectively. Each datum represents the average yield from all farms for the year and crop indicated. The influence of erosion in decreasing crop yields seems evident."

Crop Yield and Soil and Water Losses Per Acre in 1946 - G. W. Hood, Batesville, Arkansas.-

Cropping System	Surface Runoff		Soil Loss Per Acre	Yield per acre
	Percent	Inches	Tons	
Baxter Soil				
Continuous cotton with slope	28.78	11.69	39.43	175 lb.
Continuous cotton on contour	24.74	10.74	38.48	158 lb.
Cotton in rotation on contour	21.37	8.76	18.35	874 lb.
Corn in rotation on contour	22.16	9.24	21.59	8.5 bu.
Oats in rotation on contour	31.34	13.76	6.17	12.5 bu.
Ozark Soil				
Continuous cotton with slope	27.53	10.57	110.81	401 lb.
Strip Crop				
Cotton in rotation on contour				663 lb.
Corn in rotation on contour	8.43	3.12	6.69	22.9 bu.
Oats in rotation on contour				53.5 bu.
Bermuda grass	1.69	.89	0	

"Crop yield, soil and water losses for 1946 are shown in the accompanying table. A three year rotation of cotton, corn and oats with vetch and lespedeza as soil improving crops were used. The vetch was sown in the cotton after the last cultivation, and the lespedeza was sown in the oats in the early spring. Both vetch and lespedeza were used as companion crops and no time was lost from the regular rotation. The rainfall for the year totaled 59.21 inches---which was 11.21 inches above the 40 year average.

"The tests were made on both Baxter and Ozark soil and considerable variation is noted. Strip crop pattern continues to show the highest yield with less soil and water loss."

Effect of Sweet Clover on the Following Wheat Crop - Hugh C. McKay, St. Anthony, Idaho.-"In dry years in this area the plowing down of a sweet clover crop for green manure sometimes results in a lower yield of the following wheat crop than if a legume crop was not employed. This was especially true in 1946 when no beneficial rainfall was received during the growing season. The following table gives the yield of winter wheat in bushels per acre for the sweet clover residue trials for 1946.

Type of Plow. Height of plowing Sweet Cl.	Sweet Clover		Sweet Clover & Gr.		Ave.
	Mowed & removed	Green Manure	Mowed & removed	Green Manure	
Moldboard					
12"-14"	29.6	29.4	28.0	29.4	29.1
20"-22"	28.7	29.2	28.6	27.5	28.5
34"-36"	24.6	27.3	23.6	24.9	25.1
Average	27.6	28.6	26.7	27.3	
Modified Moldboard					
12"-14"	30.5	28.4	29.7	28.1	29.2
20"-22"	26.4	30.4	28.9	31.9	29.4
34"-36"	24.1	21.8	24.4	22.8	23.3
Average	27.0	26.9	27.7	27.6	

Averages.

Average of check plots.	29.9
Moldboard plowing, all dates and methods.	27.8
Modified moldboard plowing, all dates and methods.	27.3
Crop removed for hay, all dates and methods.	27.3
Green manure, all dates and methods.	27.6
Sweet clover, all dates and methods.	27.5
Sweet clover and grass, all dates and methods.	27.4

"All but three of the yields are lower than the average for the check plots. These three yields are in the modified moldboard plowed plots. The average yields for the various dates of plowing show that there is not much difference between whether you plow the sweet clover at 14 inches or at 22 inches,

but when the sweet clover is allowed to reach a height of 34-36", a reduction in yield of the following wheat crop can be expected. This not only occurred in 1946 under a dry season but also in 1945 under high rainfall conditions.

"The average yields show that for the first two dates of plowing the modified moldboard plow gave slighter higher yields than the moldboard plow, but for the last date of plowing it was somewhat lower than the moldboard. This lower yield was probably due to the mechanical difficulty of working through the heavy sweet clover residue on the surface, and the lack of moisture resulting from the sweet clover sapping all the available moisture the previous year.

"The average yields for the sweet clover was nearly identical with the average yields of the sweet clover and grass.

"Removing the sweet clover crop for hay did not cause a difference large enough to be significant."

The Effect of Cropping Systems on Yield of Corn, Experiments I and II, 1943-46, Marshall Silt Loam, Clarinda, Iowa - G. M. Browning, Ames, Iowa.-

Cropping System (1931-46)	Yield of Corn - Bu/A				
	1943	1944	1945	1946	Ave.
Corn 1931-46	25.7	18.7	24.3	27.2	24.0
Corn, 1931-43; oats 44; meadow 45; corn 46	-	35.3	56.7	70.6	54.2
Rotation corn, oats, meadow, 1931-46	86.1	85.2	94.4	86.0	87.9
Alfalfa, 1931-42; corn, 1943-46	106.3	83.5	72.9	70.5	83.3
Bluegrass, 1931-42; corn 1943-46	75.7	68.9	77.0	70.2	73.0
Corn (desurfaced plot) 1931-42, oats 43, meadow 44, corn 45, oats 46	-	-	33.6	-	-

"It will be noted that the yields in 1946 show the same general trend as in 1945. The yields on the corn-oats-meadow rotation were somewhat lower than in 1945. Corn in rotation following continuous corn from 1931-43 was considerably higher than in 1945 and about equal to the yields obtained on 4th year corn following 11 years alfalfa or bluegrass."

The Effect of Contouring on Yield and Stand of Corn.

"In 1946, comparisons of contouring versus up-and-down hill plantings were carried on in cooperation with six farmers in Tama County and one farm in Grundy County. The results of this study are summarized in the following table.

Treatment	Yield bu/A	Stand plants/A
Contoured	113.6	12745
Up-and-down hill	106.0	11175
Difference	7.6	1570

"The average yields and stands are considerably higher than was obtained in any previous year. The increase of 7.6 bushels per acre from contouring is in general agreement with the results obtained on a larger number of farms during the period 1942-45. The decrease in stand of 1520 plants per acre due to up-and-down hill rows is also in general agreement with the results obtained in previous years.

"In 1945 yields of corn, stand and moisture content of corn were obtained by sampling severely eroded, moderately eroded and slightly eroded areas on 10 farms in Woodbury County. A similar study was conducted on 10 farms in Woodbury County in 1946. The data are shown in the following table.

Degree erosion	Yield bu/A	Stand plants/A	Moisture Content of corn October 19, 1946
Little or no surface soil mixed in plow layer	25.9	4735	29.1
Approximately 50-50 mixture of surface and subsoil in plow layer	55.6	7796	26.8
Little or no subsoil in plow layer	80.8	9130	25.0

"In general, the results are in agreement with those obtained in 1945 in that there was a marked increase in both yields and stand with depth of topsoil. There also was a decrease in moisture content of the corn with increasing depth of topsoil. However, the differences were not as large as found in 1945. This probably is due to the fact that the corn was more nearly mature in 1946 than in 1945. It may be emphasized that these data, while taken from only 10 farms in Woodbury County are thought to be representative of a large number of farms in Woodbury, Monoma, Harrison and other counties on which the Ida soils are found."

Corn Yield in Relation to Tillage and Rotation Practices - F. L. Duley, Lincoln, Nebraska.-"The harvesting of the corn crop on our plots was finished. The corn has been shelled and moisture determinations made. The following table shows the most important yield results.

Corn Yields, 1946, on Soil Conservation Research Plots
Lincoln and Hastings, Nebraska

Field	Treatment for Corn	Bushels per acre	Stalks per acre	Ears per bu.
24-III W	Following sorghum after 1-year sweet clover			
	Subtilled	89.5	9502	108
	Plowed	89.4	9293	107
24-IV E	After 2-year sweet clover			
	Subtilled	88.5	9328	107
	Plowed	83.7	8645	100
24 III E	Following corn after 1-year sweet clover			
	Subtilled	80.6	9555	119
	Plowed	80.7	9608	117
23-VII	After 1-year sweet clover			
	Subtilled	68.5	9240	137
	Plowed	69.5	8645	126
Field B-II	Following corn on brome-grass sod			
	Subtilled	66.9	9538	140
	Plowed	73.6	9223	122
Kenny II	Following oats with sweet clover			
	Subtilled	59.0	10220	171
	Listed	58.0	7105	134
S.C.S.	Rotation plots, wheat-corn-oats rotation, no legume			
	Fall plowed - residues	58.0	10367	181
	Fall plowed - no residues	57.4	10333	178
	Spring plowed - residues	56.3	10033	173
	Subtilled for corn only	45.3	10333	196
	Subtilled for all crops-residues	44.0	10267	203
Field B-III	Following brome-grass sod			
	Subtilled	47.1	9613	182
	Plowed	50.4	9823	178
Gillen-Planting Method - Mean of four surface planting methods				
	Subtilled	46.7	8525	171
	Plowed	54.9	8992	159
Gillen-Method of Tillage Study - Mean of two depths				
	Subtilled	39.0	8073	181
	Plowed	43.5	8318	176
Hastings II-E	After 2-year sweet clover			
	Subtilled	45.7	5705	145
	Plowed	40.4	4725	149

"A demonstration field of 2 acres produced 101 bushels per acre. This field has not been plowed for 16 years. After 9 years of alfalfa it was broken out with a subsurface tiller. During the last 7 years the farming hasbeen done entirely with a stubble mulch system. Good protection against runoff and erosion has been maintained at all times. The yields have been high throughout the period.

"In general, the results with corn this year indicate still further that, where the rotation and field conditions were favorable for corn production, the yields have been about the same by the stubble mulch system as where the land was plowed. This is well illustrated by the results where sweet clover is used in the rotation. Where conditions were less favorable, either as the result of poor soils or unfavorable cropping systems, the plowing method has been slightly superior. This is shown by the results where there were no legumes in the rotation."

Effects of Contour Tillage on Yield and Value of the Tobacco Crop, 1940-45 - C. S. Britt, Beltsville, Maryland.-

Year	Yield Per Acre		Value Per Pound		Value Per Acre	
	1% Grade Ridged Rows	Up-and-Down Hill. Flat Cultivation	1% Grade Ridged Rows	Up-and-Down Hill. Flat Cultivation	-	-
	Pounds	Pounds	Cents	Cents	Dollars	Dollars
1940	1011	997	35.5	33.6	359.29	334.61
1941	1128	988	41.1	39.2	463.93	387.17
1942	1017	780	53.1	48.7	540.13	379.90
1943	647	498	48.3	48.4	312.47	240.86
1944	1363	1085	37.3	31.1	508.37	337.86
1945	1190	1063	31.7	31.7	377.33	337.20
Average 1941-45	1069	883	42.3	39.8	440.45	336.60

"Summary of experimental results:

1. One per cent grade ridged rows have given an average annual yield of 186 pounds more tobacco per acre than up-and-down hill unridged rows.
2. The quality of ridged tobacco has been superior, giving a $2\frac{1}{2}$ cent premium per pound.
3. Ridged rows have given an average annual increase of $104 per acre.
4. The higher crop values are attributed to control of erosion by use of 1% grade ridged rows since all other treatments were alike.

"Field trial: Based upon the above facts, a successful field trial was carried out during the past season on a large tobacco field on the farm of H. W. Townshend in the Prince George Soil Conservation District. A complete water disposal system of terraces, waterways and ridge rows was used. Considerable land leveling was necessary before the terraces were built. The farmer was well pleased with the erosion-controlled results of this work and with the quality tobacco crop produced. The field was a good

winter cover of wheat and vetch and will be used for tobacco again next season. Plans are now in progress to extend field trials to other interested Soil Conservation Districts in the southern Maryland tobacco belt. This field trial program is benefitting by excellent teamwork by all interested Operations and Research technicians in the Service, the Maryland Experiment Station and the farmers."

Sorghum Grain Yield as Influenced by Tillage and Cropping Practices - A. E. Lowe, Garden City, Kansas.-"Sorghum grain yields in bushels per acre obtained on the Basin Project plots at Garden City, Kansas are given below:

Cultural Treatments	1946	7 year Average
44-inch listed rows, continuously cropped		
Basined on contour	3.2	18.3
Ordinary list on contour	2.0	22.5
Basined up-and-down slope	1.8	14.7
Ordinary list up-and-down slope	1.9	14.2
88-inch listed rows, continuously cropped		
Basined on contour	5.6	13.1
Ordinary list on contour	2.2	14.1
Basined up-and-down slope	1.8	11.9
Ordinary list up-and-down slope	2.3	11.6
44-inch listed rows, one year fallow		
Basined on contour	14.0	25.0
Ordinary list on contour	16.0	23.4
Basined up-and-down slope	15.0	20.7
Ordinary list up-and-down slope	16.6	20.1
Average of the above 3 groups of treatments		
Basined on contour	7.6	18.8
Ordinary list on contour	6.7	20.0
Basined up-and-down slope	6.2	15.8
Ordinary list up-and-down slope	6.9	15.3
Average	6.8	17.5

"In spite of high yearly rainfall for 1946 it will be known as a dry year as borne out by sorghum yields because such a high proportion of it came too late to help the sorghum yields. The yields were lower than expected but good when compared with farmers yields in this vicinity. The fallow plots were exceedingly higher yielding than the continuously cropped plots regardless of the row spacing of the continuously cropped plots. The usual differences in favor of contouring as compared to farming up-and-down slope were obtained on the continuously cropped plots but for some unknown reason the fallow plots did not show this difference.

"The seven year average of all the contour sorghum plots is 19.4 bushels per acre whereas, the seven year average of all the non-contour sorghum plots is only 15.6 bushels per acre; a difference of 3.8 bushels per acre

in favor of contouring which is an increase of 24.4 per cent. There is no significant difference between basining and ordinary listing as measured by grain yield."

Hillside Plow Versus Ordinary Plow on Terraced Land - Harley A. Daniel, Guthrie, Oklahoma.-"Maurice B.Cox has just completed a survey of the soil movement lines across the terraces of the Guthrie and Cherokee stations. These findings show that the regular method of back-furrowing to the terraces mechanically erodes the interval which moves the channel midway between the terraces. This has already taken place on some of the earlier terraces on the Guthrie station. However, on the Cherokee station where a hillside plow is being used this condition is being avoided. The land is plowed alternately up hill and down which eliminates dead furrows between the terraces."

Protein Content of Wheat as Influenced by Tillage Practices - Carl L. Englehorn, Fargo, North Dakota.-"During November determinations were made on samples of wheat from the plots at Edgeley and Langdon in order to determine the possible effect of tillage practice on the quality of wheat. Though variations are not large, the results are of interest and show at least a trend toward lesser protein in the crop from stubble mulch plots as compared to plowed plots. This trend is apparent both where tillage was of a seedbed preparation and where it was for summer fallow.

"The percent of pretein is expressed on a 13.5 percent moisture basis. The crops at Edgeley were Mida wheat and those at Langdon were Carlton durum.

Table 1. The protein content of wheat as affected by method of tillage used in seedbed preparation under continuous cropping to wheat. Edgeley and Langdon

Tillage Method	Average for 3 year period, 1944-46	
	Edgeley	Langdon
Moldboard plow	13.17	11.30
Disk	12.47	11.00
Field cultivator	12.50	11.03
Subsurface tiller	12.60	10.77
Burn residue, no tillage	12.73	10.40

"For continuous cropping at Edgeley over the three year period the average percent of protein of wheat from plowed plots was 13.17, which exceeds the percent of protein from disked plots by 0,70, from plots tilled by the field cultivator by 0.67, from stubble mulch plots by 0.57 and from burned plots by 0.44. As calculated for these data the least significant difference in mean percent between any two tillage methods is 0.35; a difference of 0.50 is highly significant.

"At Langdon this trend was similar though less consistent. As calculated for these data, the least significant difference in mean percent between any two types of tillage is 0.54 and a highly significant difference is 0.78. However, the protein content of wheat from stubble mulch tillage seems to be significantly less than that of wheat from plowing.

Table 2. The protein content of wheat as affected by method of tillage for summer fallow at Edgeley and Langdon.

Tillage Method	Average for 3 year period 1944-1946	
	Edgeley	Langdon
Moldboard plow	15.30	14.10
Moldboard plow, pit	15.17	14.13
Field cultivator	14.80	13.70
Subsurface tiller	14.80	13.23

"Though wheat from plowed fallow shows a somewhat higher protein content than that from stubble mulch fallow, the differences are not high especially at Edgeley. To be of significance the difference in mean yield between any two tillage methods should be at least 0.61. At Langdon, however, the percent of protein of wheat from stubble mulch fallow is 0.87 less than of that from plowed fallow, according to the data of table 2. As calculated for these data, a difference of 0.56 in percent of protein between any two methods is of significance whereas a difference of 0.85 is highly significant.

"Of interest is the protein content of wheat from summer fallow as compared to that of wheat produced under continuous cropping. For the three year period the average percent of protein, including all tillage methods is, at Edgeley, 12.69 for wheat produced under continuous cropping and 15.02 for wheat produced on fallow. Similarly at Langdon the percent of protein of wheat produced under continuous cropping was 10.91 and of that produced on fallow was 13.79."

Protein Content, Test Weight and Yield of Grain and Straw of Wheat in Relation to Tillage Treatments - Torlief S. Aasheim, Bozeman, Montana.-

1946 Results at Culbertson (Froid), Montana

Type of Fallow		Bu. Grain per acre	Lbs. Straw per acre	Test Wt. Wht per bu.	% Protein of wheat
M. Bd. Plow R. W.	T	25.1	2621	60.1	14.4
M. Bd. Plow D.F.	T	24.0	2399	59.9	14.2
M. Bd. Plow B. L.	T	22.8	2717	59.7	14.9
M. Bd. Plow D. F. & W.	T	24.3	2795	60.5	14.1
M. Bd. Plow D. F. & W.	B	21.8	2356	60.2	15.2
Ave. all M. B. Fallow		23.6	2577	60.1	14.6
Noble cultivator	T	20.8	2147	59.8	13.8
Chase S. S. Tiller	T	23.4	2404	59.8	13.9
Chase S. S. Tiller	B	21.1	2100	59.7	14.8
Ave. All S. S. Tilled		21.8	2217	59.8	14.2
Oneway	T	22.9	2282	59.9	14.6

R. W. - Rod Weeder; D. F. - Duckfoot; B. L. - Basin Lister; W - Waffle Attachment; B - Stubble Burned; T - Stubble Unburned.

"As far as yields are concerned the trend is the same at Culbertson as it has been in previous years. Stubble mulch fallow averages a little bit lower in yield than other methods of fallow and the protein content of wheat is definitely lower where residues are left on the surface. The trashy fallow when sub-surface tilled, averages 13.9% protein. Sub-surface tilled fallow where the stubble was burned produced wheat with a 14.8% protein content.

1946 Results, Havre, Montana

Type of Fallow		Bu. Grain Per Acre	Lbs. Straw Per Acre	Test Wt. Wht Per Bu.	Percent Protein
Chase S. S. Tiller	B	15.5	1628	59.5	14.6
Chase S. S. Tiller	T	13.9	1327	59.5	14.5
M. B. Plow D. F.	B	15.0	1616	59.9	14.9
M. B. Plow D. F.	T	13.8	1333	59.7	14.7
Noble Cultivator	B	16.3	1564	59.7	14.5
Noble Cultivator	T	15.2	1330	60.0	14.5
Oneway	B	17.1	1832	59.4	14.5
Oneway	T	18.0	1737	59.6	14.6
M. B. Less Plow	B	15.6	1345	59.7	14.4
M. B. Less Plow	T	13.0	1199	59.4	14.6
M. B. Plow R. W.	B	15.0	1522	59.7	14.6
M. B. Plow R. W.	T	14.8	1531	59.6	14.6

"It is very evident that the stubble residue on the surface has not reduced protein content of wheat as much at Havre as it has at Culbertson. This may be partially due to the fact that less straw produced at Havre. Yields were not greatly different on any of the treatments but the Onewayed fallow averaged higher than any other kind. Yields were higher on all fallow where the residues had been burned except in one treatment, the oneway."

Rate of Recovery of Resistance to Runoff on Range Plots Denuded by Clipping the Vegetation and Mixing the Surface Soil - Joel E. Fletcher, Tucson, Arizona.-"In April 1941 runoff plots were established at the Page-Trowbridge Experimental Ranch. Among the treatments were two types of denuding. The first had all vegetation clipped, while in the second the surface soil was removed to a depth of three inches, mixed thoroughly and returned to the plot and packed to its original density. The recovery of these two plots under natural rainfall is reflected in the percentage of runoff from the rains falling in three rainfall intensity groups.

Ten Minute Intensities

Year	plus 3"/hr		1" to 3"/hr		less than 1"/hr	
	mixed	clipped	mixed	clipped	mixed	clipped
1941	86	82	66	45	35	17
1942	-	-	53	52	15	12
1943	70	70	42	40	30	31
1944	-	-	26	40	12	20
1945	49	65	20	32	8	12
1946	33	42	-	-	8	22

"It can be seen from these losses that the mixed plot picked up from greater losses in the beginning to lower losses at the end than the clipped plot.

"On all of the higher intensity rains the marked improvement in both plots can be seen. Observation of vegetation would indicate that the mixed plot appeared to be completely recovered by 1946 and the clipped plot seemed to be stabilized, although only time will reveal whether or not this is true of the runoff."

Grazing-Feeding Experiments with Steers - G. M. Browning, Ames, Iowa.-"The last four lots of cattle in the grazing-feeding experiment at Clarinda were sold on December 17. Dr. M. L. Peterson is summarizing the data and preparing a manuscript for publication in Farm Science for February or March. Tables 1, 2 and 3 are taken from this article and summarize part of the data obtained from these studies:

Table 1. Average gains, feed consumption and marketing results on individual steer basis for strictly dry-lot feeding compared with three systems of utilizing bromegrass-alfalfa pasture for part of fattening period with beef, Clarinda, Iowa, 1946.

	Dry-lot feeding through-out	Self fed corn on pasture	Continuous grazing; finished on dry lot	Rotation grazing and finished on dry lot.
Total feed period - days	159	193	229	229
Initial weight, May 2	726	724	722	720
Final weight when finished	1044	1101	1093	1086
Average total gain	318	377	371	366
Average daily gain	2.00	1.95	1.62	1.60
Ground ear corn consumed (bushels)	43.2	38.6	25.2	23.3
Protein supplement consumed (pounds)	157	54	87	87
Timothy-red clover hay consumed (pounds)	845	224	481	481
Acres pasture available	0	1.16	1.48	1.20
Carcass grade	11 choice 1 good	9 choice 3 good	10 choice 2 good	12 choice
Dressing percentage	60.8	62.0	61.1	59.4

Table 2. Feed saved by one acre of bromegrass-alfalfa pasture when managed in three-way feeding of beef steers, Clarinda, Iowa, 1946.

	Corn (bu)	Hay (lbs)	Protein (lbs)
1. Pasture 55 days, self fed corn on pasture 81 days; and dry lot 57 days	10.6	665	113
2. Pasture 136 days with continuous grazing and dry lot 93 days	16.6	332	63
3. Pasture 136 days with rotation grazing and dry lot 93 days	21.9	406	79

Table 3. Feed requirements per 100 pounds gain from fattening steers managed by different methods, Clarinda, Iowa, 1946.

	Corn (bu)	Hay (lbs)	Protein (lbs)	Pasture (acres)
1. Dry lot feeding throughout	13.6	266	50	0
2. Pasture 55 days; corn fed on pasture 81 days, and dry lot 57 days	10.3	60	15	.31
3. Pasture 136 days with continuous grazing and dry lot 93 days	6.8	130	24	.41
4. Pasture 136 days with rotation grazing and dry lot 93 days	6.4	132	24	.33

Winter Wheat Grazing Study - C. J. Whitfield, Amarillo, Texas.- "Sixty-four steers were placed on a good stand of volunteer wheat in J-3 (93 acres) from December 1 to December 16, 1946. They covered the area thoroughly but did not place the pasture in a condition for soil drifting. The steers went from an average weight of 394 pounds to 412 pounds, an average gain of 18 pounds for 15 days, or 1.20 pounds per day.

"The steers were shifted on December 16, 1946 to J-2, which has 93 acres of wheat and 44 acres of standing Early Hegari. There are four varieties of wheat, 23 acres each; Westar, Comanche, Tenmarq, and Blackhull. The purpose of the study is to test the effect of grazing on the different varieties with respect to the yield of grain and straw at harvest time. The value of the wheat for beef production is being measured by weighing the cattle.

"No losses from wheat poisoning have occurred. The steers have begun grazing some of the Early Hegari stalks, and some bundle feed was given at the start of grazing as a precaution."

"Grass and Cake" Steers - "The studies of the station have shown that "grass and cake" steers can make good gains every month of the winter in the Texas Panhandle when pastures are conservedly grazed, and that even better gains can be made if green forage is available in pastures re-seeded to crested wheatgrass and western wheatgrass. Much depends on the severity of the winter.

"The ten "grass and cake" steers (Lot 10) in pasture H have been grazing since December 1, 1946. They have grazed considerably on the re-seeded western wheatgrass and the samll patch of crested wheatgrass on the west side, and on the native western wheatgrass at the edge of the lake, but have avoided the cured blue grama grass to a large extent. Two pounds of cake have been fed each day to each steer.

"The steers averaged 395.5 pounds on December 1, 1946 and 448.5 pounds on January 1, 1947, gaining 53 pounds in 31 days, an average daily gain of 1.71 pounds. This is a good gain. The storm period beginning December 29 will probably cut gains for January."

Volumn Weights of Soil in Stubble-Mulch Studies - C. J. Whitfield, Amarillo, Texas.-"Samples taken in November on the stubble-mulch and other plots from differently treated areas provide the volume weight data given in the following table.

"All of the stubble-mulch plots show very close agreement in volume weight, irregardless of difference in cropping system or implements used. The one exception is the three-year fallow treatment which resulted in a slightly lower volume weight than those of the other treatments. It is also of interest that the areas previously in wheat and sorghum and re-seeded to native grasses have nearly the same volume weight values as those of the stubble-mulch treatments, while the heavily grazed native pasture has a significantly higher volume weight. That the area in weeping love-grass has a volume weight value lower than that of the native pasture but higher than those of the stubble-mulch treatments probably indicates a very high value under the past severe treatment, with a certain amount of recovery under the present excellent cover of lovegrass, some of which is about four to five feet tall.

"Cultivation operations have contributed to lower volume weight values and low annual rainfall contributes to the lack of settling and puddling into a compact soil condition. Most of the tillage is done to a depth of from one to four inches."

Agronomic Practice		Implement used	Vol. Wt. 0-6" horizon	Rotation Averages
Natural Stubble	-Continuous wheat	Oneway disk	1.14	
		Noble sweeps	1.09	
		Plow	1.08	1.11
		30" sweeps	1.09	
		Oneway disk (stubble burned)	1.11	
		Graham-Hoeme cultivator	1.13	
	Wheat & 1-yr. of delayed fallow	30" sweeps	1.12	1.12
	Wheat and 1 yr. of regular fallow	Oneway disk	1.12	
		30" sweeps	1.09	1.09
		Graham-Hoeme cultivator	1.07	
	Wheat & 3 yrs. of regular fallow	30" sweeps	1.02	1.02
Controlled Stubble	-Continuous wheat 0 lb. straw	Oneway disk	1.12	
		Plow	1.14	1.14
		30" sweeps	1.15	
	Continuous wheat 1500 lbs. straw	Oneway disk	1.14	
		Plow	1.12	1.13
		30" sweeps	1.14	
	Continuous wheat 3000 lbs. straw	Oneway disk	1.12	
		Plow	1.10	1.10
		30" sweeps	1.09	
Native bluegrama-buffalo grass pasture; heavily grazed, never plowed		-	1.28	1.28
Reseeded to native grasses in 1941 and not grazed. Previously in wheat and sorghum		-	1.14	1.14
Reseeded to native grasses in 1944 and not grazed. Previously in wheat and sorghum		-	1.14	1.14
Reseeded to weeping lovegrass in 1941 and not grazed. Previously under severeuse - Corral and grazing		-	1.20	1.20

Plants for Vegetating Broad Flat Water Channels in Oklahoma - Harley A. Daniel, Guthrie, Oklahoma.-

Species Names[1]	Conditions For Best Use				
	Fertility Requirements	Slope Maximum Percent	Maximum Silting	Growing Seasons Required[2]	Location where Adapted
Grasses (Sod Type)[3]					
Bermuda (Cynodon dactylon)	medium	15	moderate	1	south, central & eastern
Buffalo (Buchloe dactyloides)	high	8	slight	2	w. central & west
Vine Mesquite (Panicun obtusum)	high	5	slight	2-3	w. central & west
Grasses (Bunch Type)[4]					
Weeping lovegrass (Eragrastis curvula)[3] & 4	medium	5	slight	1	general
Blue grama (Bouteloua gracilis)	medium	5	slight	2-3	w. central & west
Side-oats Grama (Bouteloua curtipendula)	medium	5	slight	2-3	central & west
Yellow Bluestem (Andropogon ischaemum)	medium	5	slight	2-3	general
Grass (Mixtures)[4]					
Buffalo, Blue and Side-Oats Grama	medium	7	slight	2	w. central & west
Switch, Weeping Lovegrass, Buffalo and Blue Grama	medium	5	slight	2-3	general
Legume[4]					
Alfalfa (Medicago sativa)	high	2	slight	1	where adapted

1/ These plants have been tested in water channels on the Conservation Experiment Stations at Guthrie and Cherokee. There are, however, several other grasses and legumes that may be used under special conditions. Some of these plants are: Big and Little Bluestem (Andropogon furcatus and scoparius), Indian Grass (Sorghastrum nutans), Switch Grass (Panicum virgatum), Western Wheat (Agrophron smithii) and Lespedeza (Sericea).

2/ The seeding rate should be approximately 1-1/2 to 2 times more than that normally used in establishing meadows or pastures.

3/ Soil condition permeable to slowly permeable.

4/ Soil condition - permeable.

Do Commercial Fertilizers Kill Earthworms? - Henry Hopp, Beltsville, Maryland.-"LIFE magazine for September 30, 1946 says 'The powerful chemical fertilizer, not the robin, is the worm's greatest enemy. In recent years it has poisoned worms in such huge quantities that the world's worm population today has shrunk....'

"To test this statement, and also to learn more about the factors responsible for the decline of earthworms under certain farming methods, we studied the effect of fertilizers on earthworms.

"In one test, 16 combinations of N, P, K and Ca were used in a factorial design. The rates of application were 800 pounds of 5-10-5 and 1 ton of hydrated lime per 1,000,000 pounds of soil (about an acre-3"). The amendments were mixed thoroughly into the soil. Earthworms were kept in the soil for one month. At the end of this time, we determined the change in body weight of the earthworms and the water-stability of the soil aggregates. We found no significant effects from any of the fertilizer combinations.

"In another test, we studied the tolerance of earthworms to high concentrations of fertilizer. Commercial 5-10-5 was added in concentrations varying from 10,000 to 500,000 pounds per million pounds of soil. At 50,000 pounds, the earthworms died after a week, but at 10,000 pounds, the earthworms remained healthy and active for the duration of the study.

"In still another test, ammonium salts instead of nitrates were used as the source of nitrogen. About the same results were obtained. Ammonium nitrate was injurious at somewhat lower concentrations than ammonium sulfate. But in all cases, the concentrations were far above those used in agriculture.

Conclusions: (1) Commercial N-P-K fertilizer and lime in the amounts normally used on farmland are not immediately poisonous to earthworms;

(2) Extremely large quantities, far beyond those used for crops, will kill earthworms over a period of time if they cannot escape;

(3) The decline of earthworms on cropped land is probably not explainable by commercial fertilizers in the amounts normally used."

Glycerin Aids in Chemical Treatment of Water Hyacinth - Henry Hopp, Beltsville, Maryland.-"The work of Mr. Paul J. Linder and I did in using glycerin as a supplementary solvent for water-soluble herbicides (Amer. Journ. of Botany, July 1946) has been applied to the control of water hyacinth. Dr. Leonard Kephart, in charge of weed ihvestigations for the BPI, S & AE wrote us: 'Thank you for the separate of your article on laboratory studies on glycerin. I saw the article in time to have some plot tests made with glycerin and 2, 4-D in the water hyacinth work that we were doing last summer with the Army Engineers in Louisiana and Florida. The glycerin solutions gave outstanding results and seem to be exactly what we want."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Yields on the plowed and disked (mulch) plots and the average stand count on these plots is given in table 1 below.

Table 1.--1946 Corn plot yields

Plot No.	Yield	
	Plowed	Disked
	Bu. per acre	Bu. per acre
O-1	-	81
O-2	-	81
O-3	61	-
O-4	98	-
P-1	-	101
P-2	-	80
P-3	87	-
P-4	70	-
Q-1	91	-
Q-2	100	-
Q-3	-	120
Q-4	-	73
Average	84.5	89.3
Average stand (plants per acre)	15,600	12,100

"For 3 out of 4 years the disked (mulch) plots have out yielded the plowed plots. The differences have not been significant but at least the mulch which provides good water control has not been detrimental to yields. It is important to note that the corn was preceded by a good 4-year old alfalfa-timothy sod. Here the sod was cut up by the disk rather easily.

"On a strip cropping test where only a fair second-year meadow with little alfalfa preceded the corn and where the soil was dry and hard, the sod was difficult to cut with the disk. In general, the soil in the

strip area was at a lower fertility level than the plot area. Corn yields in the strip area are given below:

Tillage	Plot No. 1	Plot No. 2	Average
	Bu. per acre	Bu. per acre	
Plowed	51	61	56
Plowed (moldboard removed)	62	50	56
Disked	30	38	34

"The mulch corn plots were again effective in preventing soil-surface sealing thus allowing more water intake. Moisture in the 0-7- and 7-14-inch depths on the plowed plots (table 1) averaged 1 percent greater than that in the disked plots before the sod was tilled. Throughout July, August, and September the moisture in both of these depths averaged about 2 percent greater in the disked plots than in the plowed plots. Perhaps this is the reason for the greater corn yield in spite of the reduced stand count. What will be the difference in yields when the tillage operations are improved so that the stand on both the plowed and mulch plots are the same?"

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"During 1946 the total precipitation was 27.22 inches, which is 3.22 inches above the 51-year average. Since the establishment of the project in 1938 the total yearly rainfall has varied from 13.0 to 31.8 inches.

"Following is a table showing the comparison of evaporation from the Lampmann farm pond as compared to the evaporation from the U. S. Weather Bureau pan.

Month	1946 USWB pan	1946 Pond	1945 USWB pan	1945 Pond
	Feet	Feet	Feet	Feet
January	- -	0.02	- -	0.23
February	- -	.47	- -	.21
March	- -	.64	- -	.47
April	0.81	.68	0.39	.37
May	.65	.58	.60	.70
June	1.22	.77	.66	.90
July	1.05	.65	.86	.83
August	.80	.68	.92	.72
September	.53	.88	.84	.60
October	.38	.82	.51	.41
November	- -	.61	- -	.25
December	- -	.43	- -	.12
Year	- -	7.23	- -	5.81
Apr.-Oct.	5.44	5.06	4.78	4.53

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.- "Total precipitation recorded for December was 1.99 inches at the Throckmorton Farm and 2.15 inches at the Dairy Farm. The totals for the calendar year were 33.24 inches and 36.51 inches for the two farms, respectively, compared to the 'normal' of about 38.0 inches for the Lafayette vicinity.

"Water-heater elements have been installed in the stilling wells of most of the runoff measuring flumes for de-icing, using a portable motor-generator. The elements were formed to serve also as rests for the recorder floats. It is anticipated that this arrangement will greatly reduce the work that has been previously required to keep the runoff measuring equipment operating during periods of intermittent freezing and thawing.

"Analyses were made of the yield data for this year's corn plots of the hummocky-land experiments in Noble County. The following table summarizes these data:

Table 1.--corn yields, crop residue management and mulch tillage experiments, Harper-Martin Farm, Cromwell, Ind., 1946

Average Yields[1], Bushels Per Acre

Fertilizer treatment[3]	Tillage Treatments[2]							
	1	2	3	4	5	6	7	8
Low	-	50.3	56.0	60.1	55.9	56.9	56.3	55.8
High	-	61.1	53.3	61.3	58.4	59.6	52.6	54.4
Mean (L&H)		55.7	54.6	60.7	57.2	58.2	54.4	55.1

[1] Yields corrected to 17-1/2 percent moisture content of grain.

[2] 1. No tillage prior to planting.
2. Surface mulch, 2-3 inch depth of tillage.
3. Surface mulch, 6-7 " " " "
4. Residue mixed 2-3 inches deep, 2-3 inch depth of tillage.
5. " " " " " , 6-7 " " " " .
6. " " 6-7 " " , " " " " " .
7. Residue turned under 6-7 inches deep, 6-7 inch depth of tillage.
8. " " " 4-5 " " , 4-5 " " " " .

[3] Low = 125 lbs. 3-12-12, 3 inches beneath seed.
High = 500 lbs. 8-8-8, 3 inches beneath seed.

"The first seeding of corn on May 28 and 29, produced poor and erratic stands. This stand was destroyed by shallow disking once over of all plots, followed by a spring-tooth weeder which fairly well restored residues to surface on surface-mulch plots, and all plots were reseeded on June 27. The season was unusually favorable, and corn matured without frost damage. When harvested, the moisture content of the grain averaged about 35 percent.

"Slides of tables showing water losses, soil, organic matter, nitrogen, phosphorus, and potash were furnished the State Extension Soil Conservationist. The slides were based on data reported in the paper by Bedell, Kohnke, and Hickok, 'Effects of Two Systems of Farming on Erosion from Cropland', presented at the November meeting of A.S.A. These slides and displays prepared to illustrate these results of the Throckmorton Farm experiments will be used by the Extension Soil Conservationist for educational work in organization of soil conservation districts."

Hydrologic Studies - R. G. White, East Lansing, Michigan.- "There was one period of runoff during the month at the cultivated watersheds and no runoff at the wooded watershed. On the night of December 27 and 28, a total of 0.15 inch of rain fell on frozen soil. There was no snow on the ground. At watershed 'A' (rye winter cover crop) 44 percent

of the total rainfall was lost as runoff, with a soil loss of 9 pounds per acre. At watershed 'B' (brome-alfalfa sod), 13 percent was lost as runoff, with no soil loss. The maximum rate of rainfall was 0.15 inch per hour, and the maximum rate of runoff at watershed 'A' was 0.0344 inch per hour, while at watershed 'B' it was 0.0172 inch per hour."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"The total rainfall for the year, recorded at Station 69, was 40.86 inches. This is 5.96 inches more than the normal rainfall. The only severely erosive storms were those of May although there were numerous runoff periods with low rates. There was a drought period from July 22 through August 28 with only a trace of rainfall but above normal precipitation since the 28th of August has completely satisfied soil-moisture deficinecies. Most of the wet weather seeps were flowing at the end of the year."

Hydrologic Studies - John Lamb, Jr., Ithaca, New York.-"Comparing previous years, both weather and runoff conditions were off-color for the month of December. With the exception of two light rains of 0.18 inch, the balance of precipitation consisted of snow. Despite above-normal temperatures, the snow remained to ripen into a granular state. What snow melted no doubt was absorbed by the soil due to the previous month's low precipitation of 0.91 inch. A trace of runoff appeared on the open idle-land watershed due to the 0.18-inch rainfall of the 28th. No runoff has occurred on the woodland watershed since October 26."

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"On December 6 a meeting of the Committee on Hydrologic Research in the Wisconsin River Valley was held at the Hydraulic Laboratory in Madison. At the meeting I presented the results of the first calibration tests of the soil-moisture blocks at the Rainbow Reservoir. These tests were made by the use of the Toledo Moisture Tester and checked in the Soils Laboratory at the University. A copy of this preliminary report on the 'Calibration of Soil Moisture Blocks' appears below under its title.

"At the same meeting I presented results of investigations of the unit hydrograph on the 171-acre watershed at Fennimore, Wisc. and the 290-acre watershed at Edwardsville, Ill. In this study the indications are that both the peak and the position of the peak of the unit hydrograph with respect to time are affected by the intensities of rainfall producing the unit graph. Since the charts, which were shown at this meeting, were merely in pencil form and, therefore, copies are not available at this time, it would be confusing to the reader to submit the written material.

"A second set of soil-moisture determinations was made at the Rainbow Reservoir Meteorological Station and Snow Course on December 11. These moisture determinations were made with the Toledo Moisture Tester with no attempt to check them in the laboratory. Similar moisture determinations

must be made several times before the final typical curves for the gypsum blocks, which show the relationship of percentage of moisture to block resistance, can be drawn.

Calibration of Soil Moisture Blocks, Rainbow Reservoir Meteorological Station.-"Soil-moisture blocks were installed at depths up to 60 inches at the Rainbow Reservoir Station in October 1944. These consisted of two pole gypsum blocks on which the electrical resistances are measured. Under ordinary conditions these blocks would be tested for uniformity and also calibrated with the soil in which they are to be placed prior to the time of installation. The uniformity test is merely for the purpose of determining clocks which are structurally imperfect. Because of the time required for these tests and the desire to place them before freezing weather set in, no calibration was made. It, therefore, becomes necessary to attempt the calibration of these blocks in place.

"On September 10 of this year, Professor Lenz, Mr. Warnick, and myself together with the Wisconsin Valley Improvement Company representatives at the Rainbow Reservoir Station collected soil samples at a number of depths, and at the same time made resistance measurements on the gypsum blocks at these depths. These resistances of the gypsum blocks must be corrected to a common temperature for consistent results.

"A small portion of each soil sample was tested for moisture content on the Toledo Moisture Tester. This moisture tester is a simple balance or scale and the percent of moisture is read direct. The method consists of weighing out given amounts of moist soil and calcium carbide, then combining the two and shaking until the moisture in the soil joins with the carbide and passes off as gas leaving only the original carbide and dry soil. Upon weighing, the scale shows percentage of moisture direct. The remainder of these soil samples were then brought to Madison for testing in the Soils Laboratory. Determinations in the laboratory have consisted of actual moisture content of the samples as taken, the moisture equivalent, and a pipette analysis for clay content. The actual moisture content in the laboratory was determined by weighing out 100 gr. samples, drying 24 hours at 105° C and reweighing.

"A comparison of the results obtained for percentage of moisture with the use of the Toledo Moisture Tester and that obtained in the laboratory is shown in table 1 on page 25. Dr. Jackson of the University Soils Department felt that the differences in percent of soil moisture obtained by the two methods was within the limits of accuracy for this work. He was of the opinion that greater accuracy might be obtained by first screening the soil samples through a 1/8 inch mesh sieve. It was considered advisable to make a laboratory analysis for the clay content of the soil since the moisture equivalent, field capacity, and wilting coefficient all vary with this factor. The wilting point of the soil is reached when the moisture becomes so low that the plant wilts to a point

where it will not revive when placed in a saturated atmosphere. The field capacity is that amount of moisture held by the soil against the pull of gravity. Moisture equivalent is the amount held by the soil against a pull of 1,000 times gravity. The amount of moisture available to plants is considered as that between the field capacity and wilting point although the plants probably retain a small portion of the water from rainfall before the soil moisture is reduced to field capacity. The field capacity for sands is higher than the moisture equivalent while the opposite is true for clays. The wilting point for clay is higher than that of sand but so are the field capacities and available moisture.

"Additional samples must be taken from time to time until a number of points have been obtained on several of the blocks to enable us to draw a series of curves of block resistances against percentage of moisture. The location of the curve for each block will depend upon the clay content of the soil and after the family of curves has been established, it should be possible to obtain the characteristic curve of another block by a single measurement."

Runoff Studies - V. D. Young, Fayetteville, Arkansas.-"For the Bentonville studies the annual precipitation was 50.69 inches. This is the mean of siz recording gages which varied from 48.61 to 52.50 inches. March, April, July, August, September, and October were months in which the precipitation was less than normal, the balance of the months the rainfall exceeded the normal. In May the normal was exceeded 1.97 times, in June 1.28 times, in November 3.50 times and in December 2.18 times. During the dry months of July, August, September, and October the rainfall was but 38.8 percent of normal. The annual precipitation was 1.16 times normal."

Runoff Studies - T. W. Edminster, Blacksburg, Virginia.-"One draw-down pumping unit was installed. All observation wells were installed and complete soil profiles were developed for the pumping installation. Similar soil profiles were made on one tile draw-down system that had been previously installed. Delay in receiving the batteries made it impossible to start the pumping operation. These batteries have since been received and pumping operations should start the second week in January. Two permeability sites were samples and determinations run together with a series of compaction studies.

"The Project Supervisor prepared and completed a paper entitled 'The Farm Pond - A Conservation Tool', which has been submitted for clearance by the Washington Office for presentation to the Southeastern Section meeting of the American Society of Agricultural Engineers at Biloxi, Miss., on January 14. Assistance was also given to Mr. R. C. Hines, Jr. in the preparation of a paper on the Stubble Mulch Research Program in Virginia for presentation at the same meeting.

Table 1.--Determination of soil moisture for the purpose of calibrating gypsum blocks now in place
(Samples taken in September 10, 1946)

Depth of sample - Inches below Surface	Soil temp. °F at 8:30 A.M. Sept. 10	Block resistance Ohms	Moisture content percent dry weight		Percent deviation from lab. test	Moisture equivalent Percent	2 u Clay content Percent
			Toledo tester	Lab. result			
3	58.5	1,150	18.2	17.4	∕0.8	11.95	16.2
6	58.5	1,200	13.2	14.8	-1.6	10.1	13.4
9	58.3	950	12.0	11.8	∕0.2	9.7	6.6
12	58.0	850	11.0	10.9	∕0.1	8.5	8.5
18	58.0	800	7.3	9.0	-1.7	5.4	8.6
24	58.0	850	5.6	6.95	-1.3	4.4	11.8
30	57.9	825	6.2	7.3	-1.1	5.9	8.2
36	57.9	800	9.6	9.5	∕0.1	11.7	16.0
42		900	9.7	10.4	-0.7	13.4	17.4
48	58.0	750	9.4	10.4	-1.0	12.5	17.6
54		725	10.9	11.5	-0.6	11.7	14.4
60	58.0						

Precipitation at Minocqua for September 1946

Date	4	5	6	7	8	9	10	Total
Inches	.35	.10	.25	.45	.53	.32	.10	2.10

"At the request of Mr. C. N. Priode, Shenandoah District was visited to observe and study certain drainage holes that had been uncovered in the floor of a leaking farm pond. A number of photographs were taken and as soon as these have been processed, a special report on conditions found will be prepared."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.- "Mr. Anderson made 19 runs on the 2-1/4-inch model pipe drop-inlet spillway with the pipe placed on a 5 percent slope. The entrance and bend-loss coefficient for this series was found to be 0.96 as compared to 0.91 when the pipe slope was 2.5 percent and 0.75 when the pipe was set on a 30 percent slope. The 1-1/8-inch drop-inlet spillway model was lengthened from 20 pipe diameters to 40 pipe diameters and placed on a 30 percent slope. Eighteen test runs were made on this model. The data obtained from these tests showed that the disturbance caused by the bend extends at least 40 pipe diameters downstream from the junction of the riser and the pipe. The local pressure variations from the hydraulic grade line were of approximately the same magnitude for the 40-diameter length of pipe as for the 20-diameter length when the local pressure variation was expressed as a function of the velocity head in the pipe. From an analysis of all the test runs to date it has been concluded that a model having a pipe sufficiently long to insure a test section having normal velocity distribution must be tested in order to determine the loss in the riser and the bend. Plans are now being made to test a model having a pipe length of 100 to 120 diameters.

"Mr. Blaisdell and Miss Gosslin spent a few days making computations for the reduction in size of the SAF stilling basin that could be achieved by using a transition to spread out the flow before it entered the stilling basin. It had been anticipated that some saving would be possible, but the magnitude of the computed savings was a surprise. It was estimated that the amount of concrete used would be only one-half that required if no transition is used. In addition, savings in excavation up to 20 percent will be possible. No time was available to complete the first draft of the report covering the transition studies to date."

Hydraulic Studies - W. O. Ree, Stillwater, Oklahoma.-"Tests run during this period include velocity distribution measurements in channel FC3A. These measurements have not been completely analyzed as yet. However, some preliminary results can be presented.

"Channel FC3A was originally constructed as a 'V' shaped channel with 1 on 10 side slopes. It now roughly approximates a shallow parabola in shape. The bed slope is 3 percent. The cover is Bermuda grass. At the time of the tests it was uncut (8 inches long) and dormant. A flow of 16 cubic feet per second had a top width of 19.7 feet and a depth of 0.65 feet. Under this flow the grass was submerged for a center width of 12.4

feet. At the center line of the channel the distance from the bottom of the channel to the top of the mat of submerged grass was approximately 0.27 foot.

"A careful pitot tube traverse from channel bottom to water surface revealed the following velocity distribution in a center line vertical:

Distance above bottom feet	Velocity ft/sec
0	0
.18	.6
0.18 to 0.26	irregular 0.6 to 1.9
.26 to .65	'normal' velocity distribution curve from 1.9 to 7.0 ft./sec.
.65	7.0

"Examining these data it will be noted that for the first 0.18 foot from the bottom, or over 25 percent of the depth, the velocity was under 0.6 foot per second. Also the velocity gradient (rate of change of velocity with depth) was relatively low near the bed. These observations help explain why a vegetal cover protects a channel bed from scour. First the grass 'insulates' the channel bed from the high velocities above, and second the greatest shear intensities due to the velocity gradient are not at the bed but at the top of the grass mat, 0.27 foot above the channel bottom in this case.

"In the depth range from 0.18 to 0.26 (foot above bottom) the measurements varied considerably. In this depth range the grass tops were whipping and waving in the flow. This probably interfered with the operation of the pitot tube. In using a pitot tube in the grass mat great care had to be taken to make sure a grass stem or blade was not immediately upstream of the impact orifice.

"During the velocity distribution measurements observations were made of the hydraulic characteristics of channel L-2. Since this channel has a 0.5 percent bed slope the data will be of great value in checking the n-VR relationship for mild slopes."

Sedimentation Studies - L. C. Gottschalk, Washington, D. C.- "An analysis of hydrologic data of the Winooski River in Vermont was started to determine the effect of floods and flood control on bank-protective measures installed on this stream in 1935 as part of the Winooski Demonstration Project. The results of this analysis will be incorporated in a comprehensive report on the durability and effectiveness of the different types of protective measures used on this stream."

Sediment Studies - Vito A. Vanoni, Cooperative Laboratory, California Institute of Technology, Pasadena, California.-"Studies were conducted on movement of bed-load in the 10-inch flume, using bed material with a grain size of 0.2 mm. which forms a smooth bed in this flume. Studies of the movement of bed material load, in general, have been conducted on beds which behave hydraulically rough. For very fine sediments the bed no longer acts as a rough surface, but as a smooth one, and under these conditions the general transportation law does not apply.

"Experiments were made in the 33-inch flume using a fixed slope with two depths of flow and with two different sediment loads. With small amounts of material, the sediment-distribution profiles were erratic. When the amount of material was increased, the profiles became more uniform, although they still showed some erratic tendencies. The full significance of these observations has not yet been determined, although it appears that these are manifestations of the effect of not having sufficient sediment available to completely load the stream.

"Some time was spent in planning an educational motion picture on the subject of density currents and their application to the operation of reservoirs. This motion picture will be suitable for introducing the idea of density currents to field technicians and to engineering students."

Sediment Studies - V. J. Palmer, Ithaca, New York.-"During the period September 23 to September 27, L. C. Gottschalk, Geologist, Sedimentation Section, Washington, D. C., and V. J. Palmer developed an initial draft of the working plan for the stream bank stabilization project to be established with headquarters at Ithaca, New York. The transfer of Mr. Palmer from Stillwater, Oklahoma, to Ithaca, New York, was consummated.

"On November 12 and 13, a conference was held in East Aurora, New York, relative to the Soil Conservation Service Flood Control Project on Buffalo Creek, near Buffalo, New York. Attending were James A. Muncey, Chief, Regional Water Conservation Division; W. S. Atkinson, Regional Engineer; Frank C. Edminster, Regional Biologist; F. H. Eisenhard, District Conservationist; William Shannon, Party Leader; and V. J. Palmer, Research Division. A tour was made of upper portions of the watersheds, viewing and discussing various types of bank erosion and methods of control. A 'pilot' section was tentatively selected in which actual construction work should begin in fiscal year 1948.

"At the above conference a report was prepared containing suggestions and recommendations as to the order and manner of accomplishing the work. The easement and maintenance problems, both considered very important, were subject to considerable discussion. The report included the recommendation that the collection of hydrologic and sediment data begin as

soon as possible on a few select sites. Assistance by Research in setting up a program, furnishing equipment, and in analysis and interpretation is desired. The impression was also given that the assistance of Research in selecting and designing bank stabilization work and in evaluating bank stabilization measures that will be installed in the 'pilot' section is desired."

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Indications from the first year's study of our water table and rainfall on the virgin rockdale and rockland soils shows that after a dry spell this material will only retain about 0.5 of an inch of water. There has been a lot of discussion as to how much water can or should be applied in one irrigation application. In grove areas that have been scarified and a mulch has been developed the material will hold about 1.0 inch of water before a downward movement occurs. Studies are being initiated in the Sub-tropical Experiment Station to try to determine just how much water a well-developed grove area will retain before losses occur.

"Analysis of the chloride samples for the Miami area indicates that there is a slight increase in the chloride concentration of the surface layer. It will be interesting to follow this through this year's cropping season as there are structures in some of the canals while in others structures have not been built.

"Sampling was started on the Goulds canal December 17, 1946. The first sampling showed that chlorides were relatively high, 1,100 p.p.m. to a distance of a mile west of the structure. The structure is located about one-half mile from the Bay. We are hoping that we can start several of our other lines during the January period."

Drainage Studies - James Turnbull, Lake Alfred, Florida.-"Irrigation of the experimental plots was completed early in the month and it is expected that the second irrigation of the season will be required early in January since only 0.67 inch of rain was recorded in December.

"The lake level is now dropping rapidly as adjacent groves are being irrigated by water pumped from the lake. The water table continued to drop but showed a leveling-off tendency immediately after irrigation of the portion of the grove in which the wells are located.

"Plans for the construction of a machine for stirring and leaving pockets in the soil under the trees are now on the drawing board and as soon as a mechanic can be spared from other work an experimental model will be built. A machine of this type should help destroy the resistance to wetting which exists under many of the citrus trees of this area."

Drainage Studies - I. L. Saveson, Baton Rouge, Louisiana.-The writer assisted the Arkansas Extension Service with a mole-drainage demonstration on December 16 and 17 at the Arkansas Sub-Cotton Experiment Station, Clarksdale, Ark.

"Monday was spent in selecting a site for the demonstration. The cultivated fields were too wet for a demonstration or did not have an adequate outlet. A pasture field was selected for the site. Other arrangements were completed for the demonstration, such as power, equipment details, and conference with the local county agent.

"The demonstration was held Tuesday, December 17, using a 50 h.p. Diesel Caterpillar tractor and #32 Killifer pan breaker with mole-ball attachment. A number of moles were drawn in the morning for the county agents attending the demonstration. The demonstration was attended by 21 county agents and assistant county agents, Mr. J. M. Thomason, District County Agent Supervisor; Mr. Thompson and Mr. Stokes of the Riggs Implement Company; extension engineers Gattis and Rambo; and three members of the Experiment Station staff. Much interest was shown in the field in spite of the raw cold day.

"The machine worked reasonably well but we encountered the same difficulties that we had in Texas and North Dakota; that is, the machine cannot readily be adjusted to changing depth while operating in order to put the mole channels on a grade. A number of the county agents raised this question, pointing out that the areas most farmers want to drain are small pot holes. The machine had a rectangular point and the mole ball did not make as good a compacted cylindrical channel as we would like.

"In the afternoon a round table discussion with the group was held on mole drainage. The discussion was led by County Agent Supervisor J. M. Thomason. This was a lively discussion and a very interested group.

"Cane harvesting and grinding was completed on practically all of the plantations by January 1, 1947. The cane yields are in general approximately 10 percent lower this year, due to a wet spring. Sugar planters were not able to cultivate their cane in order to adequately control weed growth this spring, resulting in a lower yield. During the month of May it rained on 15 days with a rainfall of 14.94 inches. Rainfall for the past season has been above normal. In some sections of the cane territory an average year's rainfall was recorded by July 1.

Table 1.--Land grading for drainage, St. Delphine Plantation (Cinclare Plantations) Addis, La.

Treatment	Acre	Total tons	Tons per acre	Brix	Sucrose	Purity	Sugar: Per ton	Sugar: Per acre
Graded	6.4	166.83	26.07	15.66	12.49	79.76	167.46	4365.7
Ungraded	6.3	139.68	22.17	16.13	12.05	74.73	155.3	3443.0
			3.90		More sugar - - - -		12.16	922.7

"The above shows the graded cuts yielding 3.9 tons more cane to the acre, also having a higher sugar yield. Cane from the graded cuts yielded 12.16 pounds more sugar per ton of cane and 922.7 pounds more sugar per acre. On a cane-price basis at average market of $7.50 per ton resulted in $29.25 per acre more return. On a raw sugar basis at current price of $5.94 per cwt, $54.81 increased returns per acre."

IRRIGATION DIVISION

Water Requirements for Irrigation - Water Spreading - A. T. Mitchelson writes from Berkeley, California.-"Around mid-December work was begun on leveling of the 6-acre tract of farm land near Madera, Calif., to be used as an experimental project. The job was expected to be ready for installation of equipment shortly after the beginning of the calendar year 1947. The 6 acres are to be leveled and sloped so that there will be 23 strips, each two divided by a ridge somewhat on the order of alfalfa fields. Each strip is to be about 14 feet from toe to toe of dividing ridge and each strip will be 600 feet long with a slope of 0.2 foot on the long axis. Every second or alternate strip will be planted to a selected grass or other crop and will be separated from the neighboring strip by a check or dry strip."

Motion Picture on Irrigation.-Ivan Wood writes from Denver, Colo., that the University of Nebraska, Department of Conservation of Nebraska, and Soil Conservation Service have held meetings preliminary to making a motion picture on irrigation. Mr. Wood "was asked to serve as chairman of the committee for production of such a picture."

Estimating Water Requirements.-Wayne Criddle, in Boise, Idaho, spent much of December "preparing preliminary data for revision of report on "Estimating Water Requirements in Irrigated Areas from Climatological Data", by Blaney and Criddle. From a preliminary examination of these data it is believed that monthly factors for estimating consumptive use can be established which will make the method applicable and accurate, especially in those areas having extremely long growing seasons."

Water Laws and Water Rights - Wells A. Hutchins, Berkeley, California, reports on Hawaii water-law study.-"Work on this project consisted in completing the index, and checking page proof, of the report entitled 'The Hawaiian System of Water Rights,' which is being printed by the Honolulu Board of Water Supply.

"The index was finally completed and was sent to Honolulu on December 24. The index is in considerable detail, in order to be as useful as possible to one who consults the report as a work of reference. Word has been received that the index was received and will be printed shortly.

"All of the page proof, except for the index, was checked and returned to Honolulu. The printing of the report should be completed very shortly."

J. Howard Maughan writes from Logan, Utah.-"Small, weak, and inefficient irrigation companies present a principal problem of irrigation in Utah. Many irrigation leaders are well aware of this problem. The difficulty is in converting the rank and file of water users to the merits of consolidating their interests with those of similarly situated users. On December 10, Mr. Merrill E. Cook, County Agricultural Agent, Wasatch County, called at the office by appointment to discuss the needs and

possibilities of consolidating irrigation rights on Lake Creek, a stream serving perhaps 1,500 acres of land east of Heber, Wasatch County. The water rights in the area are held by a small irrigation company and various independent users, resulting in considerable conflict of interest. The farmers are reported to be in favor of consolidation of rights and the development of cooperative water facilities.

"The principal problem appears to be the working out of a basis for equitable appraisal of water rights. Water-supply records are very incomplete and dependable supply records are essential to satisfactory appraisal of rights. Mr. Cook was advised to work with SCS Work Unit at Kamas in setting up a program to secure necessary water records.

"It was agreed that Mr. Cook, as County Agent, will take the lead in furthering this project. As work proceeds, SCS Research will act in an advisory capacity in the assembling of needed data and in working out a formula for consolidating water rights into a mutual irrigation company or other acceptable organization."

Sources and Storage of Irrigation Water - Rainfall Analysis - Dean C. Muckel reports from Escondido, California, on a cooperative study with Escondido Mutual Water Company.-"An analysis of the rainfall occurring in Escondido Valley has been started. During the past 58 years annual rainfall has varied from 36 percent to 204 percent of the average. The driest 2-year period averaged 51 percent of normal, the driest 3-year period averaged 60 percent of normal, and the driest 5-year period averaged 66 percent of normal. It is calculated that a rainfall of 75 percent of the average must occur before there is an excess over the hillside consumptive-use requirements. Normal hillside consumptive use has been calculated as being 14.5 inches and the annual rainfall at Escondido is 16.10 inches, increasing to about 20 inches at the highest points of the watershed."

Hydraulics of Irrigation - Canal Lining - Carl Rohwer reports from Ft. Collins, Colo.-"Computation of results of seepage measurements on College East Farm Lateral during 1946 were completed and tables prepared. The observation on the concrete-lined sections shows that seepage decreases with time for a while, but after an initial decrease it begins to increase. The 1945 observations showed the same trend. Tables for the revision of the Seepage Report were checked and retyped. Copies of the illustrations for the report were prepared.

Drainage of Irrigated Land - Imperial Valley Drainage Investigations - W. W. Donnan reports from Imperial Valley, Calif.-"During the past few months 15 tile-drainage systems have been designed for the soil-conservation district which we are cooperating with. In designing these systems and recommending remedial measures for drainage problems we have used the tile spacing formula and other techniques developed by the Research Project.

"These techniques for analyzing drainage problems and the tile-spacing formula have proved very adaptable to the Operations Farm Planning here in Imperial Valley. They have now been adopted as standard procedure in conservation planning on individual farms.

"As a follow-up, Research is inaugurating a series of tests on those designed tile systems which are being installed. In the initial phase of this work the validity of our recommendations will be analyzed. Eventually it is hoped that the techniques of making drainage investigations may be streamlined to further fit the needs of Operations."

1/27/47